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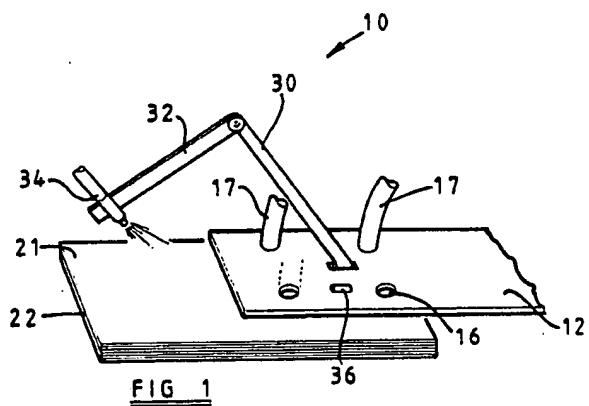
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(54) Air jet separation device

(57) The top-most ply 21 of a stack 22 of fabric sheets is separated by a generally planar head (12) having a number of openings (16) through which suction can be applied. An air jet nozzle 34 directs a stream of air over the top-most ply (21) to cause the latter to vibrate. Suction is then applied through the openings (16) to grip the ply, following which the air-stream may be removed. The plate (12) may then be raised to remove the ply (21) from the stack, e.g. by arms 30, 32. An aerofoil device 38, Fig. 2 may be used to cause a difference in pressure. Optical sensor 36 may determine when suction is to be switched off, but over-ridden by pressure-sensing device in one of tubes 17 in case of a double feed.



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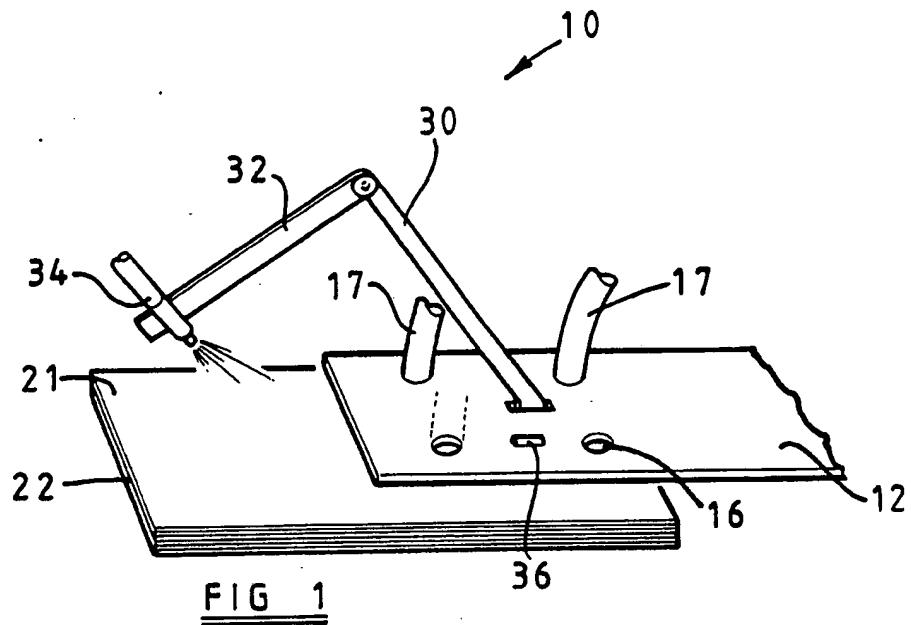
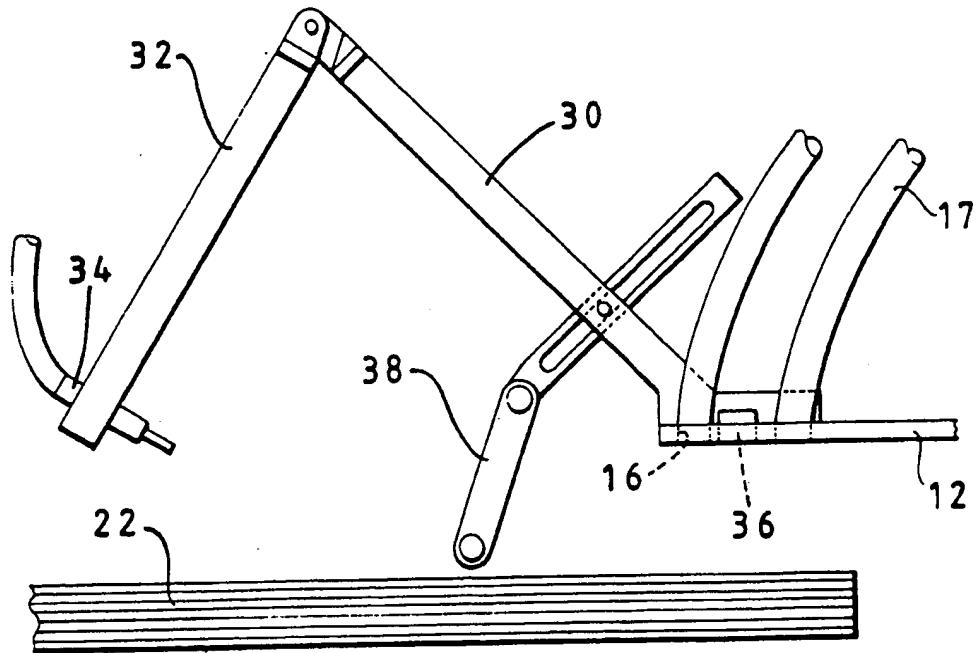


FIG 2



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Title: Air Jet Separation Device

The present invention relates to the separation of an item from a stack of such items such as sheets of fabric or other material.

UK Patent Application No. 2134085 describes an apparatus for separating the top sheet of fabric from a stack of fabric sheets to enable the separated sheet to be transferred to a workstation. The apparatus uses an air jet to vibrate the top-most item of the stack so that it separates from the next adjacent item and allows mechanical gripping members to grip the item and remove it from the stack. While this apparatus works effectively with many types of fabric, certain types of fabric such as spectacle cloths exhibit a high degree of "stickiness", for example as a result of the generation of static electricity in the cloths, which makes it extremely difficult to separate the fabric sheets. This feature also tends to be more marked when dealing with relatively small sizes of sheets of the order of several inches in dimensions.

Accordingly, the present invention provides separation means for an apparatus for separating an item from a stack, the separation means comprising pick-up means having a first surface for engaging an upper surface of the top item

of said stack, said first surface having at least one through-opening; means for directing an air stream over the top item of said stack to disturb said top item; and suction means for applying suction to said through-opening to cause said pick-up means to grip said disturbed top item for removing said item from said stack.

The present invention also provides an apparatus for separating an item from a stack having separation means as described in the immediately preceding paragraph.

The present invention is further described hereinafter, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a perspective view of one embodiment of a pick-up member of the present invention; and

Figure 2 is a side view of the embodiment of Figure 1 showing an aero-foil device.

Referring to the drawings, Figure 1 shows a form of pick-up member 10 which has a head 12 in the form of a generally flat plate formed with a number of through-holes forming nozzles 16'. These are connected to tubes 17 in turn connected to a suction device to apply suction to the nozzles 16.

The head 12 is supported by pivotally interconnected arms, 30, 32 which enable the head 12 to be raised from and lowered onto the top-most ply 21 of the stack 22.

An air jet nozzle 34 is positioned over the stack to direct an air jet across the upper surface of the top-most ply 21. This causes the ply to vibrate as the air jet causes a reduction in pressure above the ply, which results in the ply 21 partially lifting from the stack 22. A high pressure air jet is applied for about 0.5 seconds to initiate vibrations in the top ply, followed by a lower pressure jet to sustain the vibrations.

The head 12 which is positioned adjacent the margins of the ply 21 and slightly thereabove, senses the lifting of ply 21 by means of an optical sensor 36 in the head 12. The sensor 36 is obscured by the ply 21 as it rises from the stack 22 and this generates a signal which is used to apply suction to the through-holes 16 and turn off the air jet from the nozzle 34. However, a pressure sensing device (not shown) provided in one of the tubes 17 is arranged to detect the presence of more than one ply and in such a case prevent the air jet being switched off. The apparatus will then proceed only when one ply is in a lifted condition. The ply 21 is firmly gripped by the head 12 and can be lifted from the stack 22 by action of arms 30, 32.

The top ply can be separated completely by moving the head 12 away from the stack in a direction at an angle of about 30° to "peel" the ply from the stack.

It will be appreciated that while an illustrative shape of the head 12, has been described above, any suitable shape may be used.

In another arrangement (not illustrated) a broad blade may be inserted between the top ply and the stack to complete the separation.

Figure 2 shows a side view of an alternative arrangement similar to that shown in Figure 1 and including an adjustably mounted aerofoil device 38, which causes a difference in air pressure over part of the top ply to enhance the lifting and suction action.

All the alternative examples of apparatus described in the Figures may be maintained in a stationary position (i.e. no adjustment needed for stack level changes) by providing a rising platform to support the stack of items to be separated.

Various modifications may be made within the scope of this invention.

CLAIMS:

1. Separation means for an apparatus for separating an item from a stack, the separation means comprising pick-up means having a first surface for engaging an upper surface of the top item of said stack, said first surface having at least one through-opening; means for directing an air stream over the top item of said stack to disturb said top item; and suction means for applying suction to said through-opening to cause said pick-up means to grip said disturbed top item for removing said item from said stack.

2. Separation means as claimed in claim 1 wherein said means for directing an air stream over the top item of said stack is operable to direct said air stream at a first, higher, pre-selected air pressure to initiate vibrations in said top item, and subsequently at a second, lower air pressure to maintain said vibrations.

3. Separation means as claimed in claim 1 or 2 further comprising sensing means for sensing the disturbance of said top item.

4. Separation means as claimed in claim 3 wherein said sensing means is optical sensing means in said pick-up means.

5. Separation means as claimed in claim 3 or 4 wherein said sensing means is operable to activate said suction means to cause said pick-up means to grip said top item in response to the sensing of disturbance of said top item.

6. Separation means as claimed in claim 5 wherein said sensing means is further operable to de-activate said means for directing an air stream over the top item following activation of said suction means.

7. Separation means as claimed in claim 6 wherein said sensing means comprises pressure sensing means for monitoring suction pressure applied through said through-opening, said suction pressure being representative of the number of plies gripped by said pick-up means, and said pressure sensing means is operable to prevent de-activation of said air stream means in response to said suction pressure dropping below a pre-selected level.

8. Separation means as claimed in any preceding claim further comprising aerofoil means coupled to said pick-up means for suspension over said top item, said aerofoil means being operable to cause a difference in air pressure over a portion of said top item for enhancing separation of said top item.

9. Separation means substantially as hereinbefore described with reference to the accompanying drawings.